From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF TRANSMITTAL
OF COPIES OF TRANSLATION
OF THE INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY
(CHAPTER I OR CHAPTER II
OF THE PATENT COOPERATION TREATY)
(PCT Rules 44*bis*.3(c) and 72.2)

To:

SONN & PARTNER
Riemergasse 14
A-1010 Wien
AUTRICHE

EINGELANGT
- 2. Nov. 2006
FRIST:

Date of mailing *(day/month/year)* 26 October 2006 (26.10.2006)	
Applicant's or agent's file reference R 44451	**IMPORTANT NOTIFICATION**
International application No. PCT/AT2004/000382	International filing date *(day/month/year)* 29 October 2004 (29.10.2004)
Applicant FRONIUS INTERNATIONAL GMBH et al	

1. **Transmittal of the translation to the applicant.**

☐ The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter I).

☑ The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter II).

2. **Transmittal of the copy of the translation to the designated or elected Offices.**

The International Bureau notifies the applicant that copies of that translation have been transmitted to the following designated or elected Offices requiring such translation:

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The following designated or elected Offices, having waived the requirement for such a transmittal at this time, will receive copies of that translation from the International Bureau only upon their request:

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3. **Reminder regarding translation into (one of) the official language(s) of the elected Office(s).**

The applicant is reminded that, where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability (Chapter II).

It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned within the applicable time limit (Rule 74.1). See Volume II of the PCT Applicant's Guide for further details.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Yolaine Cussac
Facsimile No. +41 22 338 82 70	Facsimile No. +41 22 338 82 70

TRANSLATION

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
R 44451		
International application No.	International filing date (*day/month/year*)	Priority date (*day/month/year*)
PCT/AT2004/000382	29.10.2004	31.10.2003

International Patent Classification (IPC) or national classification and IPC

H02M7/5387, H02M7/537, H02J3/38, H02M7/48

Applicant

FRONIUS INTERNATIONAL GMBH

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 11 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 2 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/AT2004/000382

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (Rule 12.3 and 23.1(b))

☐ publication of the international application (Rule 12.4)

☐ international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-13 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

nos. _____ as originally filed/furnished

nos.* _____ as amended (together with any statement) under Article 19

nos.* 1-8 received by this Authority on 03.06.2005 with letter of 30.05.2005

nos.* _____ received by this Authority on _____

☒ the drawings:

sheets 1/3-3/3 as originally filed/furnished

sheets* _____ received by this Authority on _____

sheets* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/AT2004/000382

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-8	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-8	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

1. Reference is made to the following documents:

D1: US 2002/001210 A1 (KURANUKI MASAAKI ET AL)
3 January 2002 (2002-01-03)

D2: US 2003/012038 A1 (WELCHES RICHARD S ET AL)
16 January 2003 (2003-01-16)

D3: PATENT ABSTRACTS OF JAPAN, vol. 018, no. 003
(E-1485), 6 January 1994 (1994-01-06)
& JP 05 244775 A (OKUMA MACH WORKS LTD),
21 September 1993 (1993-09-21)

D4: CALAIS M ET AL: "Multilevel converters for single-phase grid connected photovoltaic systems: an overview", SOLAR POWER, PERGAMON PRESS, OXFORD, GB, vol. 66, no. 5,
August 1999 (1999-08), pages 325-335,
XP004362671 ISSN: 0038-092X.

2. Inventive step

The applicant is advised that expressions such as "more particularly" and "for example" do not restrict the scope of protection of the claim, that is to say, any feature preceded by such an

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expression must be considered entirely optional (see PCT International Search and Preliminary Examination Guidelines, paragraph 5.40).

2.1 Independent claim 1

The present application fails to satisfy the requirements of PCT Article 33(1) because the subject matter of claims 1 to 7 does not involve an inventive step (PCT Article 33(3)).

Using the wording of claim 1, in so far as possible, document D1 discloses the following (the references in parentheses are to said document):

a method for a converter, in particular a solar converter, for supplying an AC voltage network with power generated by a DC voltage source, the power generated by the DC source (*figure 18; paragraph 425: according to paragraph 147 the voltage V_{in} is supplied from a DC source*) being chopped by a bridge converter (*figure 18: bridge converter comprising switches 11S, 12S, 13S, 14S*) by the switching of switching elements in turn, said switching elements being connected in parallel and in series, as a form of pulse-width modulation (*figures 2 and 16; paragraphs 425 and 155*), the chopped power being transmitted via a transformer which is connected between the serially connected switching elements (*figure 18,*

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transformer 3) and the transmitted power then being rectified again (*figure 18: the rectifier is attached to the secondary winding of transformer 3 and comprises diodes 4b and 4c*) and supplied to the AC network via a step-down converter, the switching time of the switching elements of the bridge converter being controlled and regulated for adjusting the output (*figure 18; paragraph 425; figures 2 and 16; paragraph 155*), the power generated by the DC voltage source being detected at, in particular cyclical, intervals or continuously (*figure 18: the power generated by the DC source is detected by detecting the flow, using a current transformer 9*) and a dead time of the bridge converter switching elements being adjusted as a function of the detected power from the DC voltage source (*figure 18, 2, 6 and 16; paragraphs 425, 35, 156, 157, 161, 185, 192, 196, 197, 198 and 228-233; abstract: the "dead time" - and hence the switching time - is adjusted as a function of the power detected by the current transformer 9 and, hence, of the power generated by the DC voltage source since, as can be seen from figure 6 and the aforementioned citations, the dead time can either be set, as a function of the detected flow, at two values (D1 or D2) or be continuously adjusted*).

Thus, the subject matter of claim 1 differs from the known document, document D1, in that:

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- the power generated by the DC voltage source is supplied to an AC voltage network;
- the power supplied via a transformer and rectified using a buck converter is supplied to the AC voltage network.

The problem addressed by the present invention can consequently be regarded as that of modifying the arrangement shown in D1 (see figure 18) in such a way that the output voltage V_{out} can be made available to an AC voltage network.

The solution to the above problem, as proposed in claim 1 of the present application, does not appear to be inventive (PCT Article 33(3)). The reasons are as follows:

a person skilled in the art who is seeking to address the problem of interest would seek documents indicating a possible way of transforming a DC voltage or a DC current into an AC voltage or an AC current and, in so doing, would come across document D2.

Document D2 (see figure 1 in conjunction with paragraph 72) discloses an arrangement in which a DC voltage is transformed into an AC voltage that can be supplied to an AC voltage network. The full bridge converter 70 according to D2 (see figure 1) in combination with the filter 80

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constitutes a step-down converter (see figure 11a in combination with page 333, left-hand column, lines 9-10).

Accordingly, a person skilled in the art would connect the serial connection from the full-bridge converter 70 and the filter 80 according to D2 (figure 1) to the output of the switching arrangement according to D1 (figure 18), thereby arriving without inventive input at the solution as per claim 1.

Moreover, the combination of documents D1 and D2 is merely a sequential arrangement of known methods, each of which operates in a normal manner, no inventive functional interaction resulting therefrom (PCT International Search and Preliminary Examination Guidelines, paragraph 13.14(c)). Thus, the DC-DC conversion via a transformer is known from D1 (see figure 18) and the immediately following DC-AC step-down conversion is known from D2 (see figure 1).

Claim 1 is therefore novel but does not appear to be inventive (PCT Article 33(1) and (3)).

2.2 Independent claim 7

Independent claim 7 relates to method claim 1. The arguments set out in respect of claim 1 therefore apply in a similar manner to claim 7.

Thus, claim 7 is novel but does not appear to involve an inventive step (PCT Article 33(1) and (3)).

2.3 Dependent claims 2-6 and 8

Dependent claims 2-6 and 8 do not appear to contain any features which, combined with the features of any claim to which they refer, meet the PCT requirements for inventive step (see the following prior art citations):

2.3.1 Claim 2

Claim 2 does not appear to be inventive relative to documents D1, D2 and D3, since D3 (see the abstract in combination with figures 2 and 3) indicates that the frequency of the pulse modulation is adjusted as a function of the current measured at the AC converter output. Said measured current can be regarded as representing the power supplied by the DC voltage source 9. The frequency, and hence also the period length of the pulse-width modulation, is consequently a function of the detected power.

Claim 2 is therefore novel but does not appear to be inventive (PCT Article 33(1) and (3)).

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2.3.2 Claim 3

According to figure 6, measured current, and hence the power generated from the DC voltage, can be assigned to the dead time, and hence to the switching time, and the switching times can therefore be evaluated as follows. Furthermore, using control circuit 7 and dead-time circuit 8, the dead times, and hence also the switching times, can likewise be adjusted as a function of the measured current, and hence as a function of the power supplied from the DC voltage source, (see D1, figure 18), and, in consequence, the switching times can be automatically adjusted as a function of the detected power.

Claim 3 is therefore novel but does not appear to be inventive (PCT Article 33(1) and (3)).

2.3.3 Claims 4 and 5

In D1 (see figure 18 in combination with paragraphs 425 and 157), it is indicated that that the "time average" of the flow measured by means of the current transformer 9 can be used for subsequent processing. Furthermore, it can be seen from said document (see figure 6 in combination with paragraph 233) that there is a functional relationship between the measured current and the switching time values and, hence,

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the dead times. In order to reproduce a functional relation of this type in a control system which is implemented in the "delay circuit 8" and the "control circuit 7" (see D1, figure 18), a person skilled in the art would undoubtedly select from a limited number of known implementations (PCT International Search and Preliminary Examination Guidelines, paragraph 13.14(e)(i)) that might include both the software representation of the mathematical function *per se* and a "look-up" table containing the necessary threshold values of said function.

Claims 4 and 5 are therefore novel but do not appear to be inventive (PCT Article 33(1) and (3)).

2.3.4 Claim 6

The activation of the switching elements at appropriately fixed times can be derived directly from D1 (see figures 2 and 16 in combination with figure 18 and paragraph 425: see times TO to T8.

Claim 6 is therefore novel but does not appear to be inventive (PCT Article 33(1) and (3)).

2.3.5 Claim 8

The combination of features defined in claim 8 can be derived directly from figure 18 in combination

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

with paragraph 425 and paragraph 230. Claim 8 is therefore novel but does not appear to be inventive (PCT Article 33(1) and (3)).

3. Industrial applicability

There are no objections with regard to the industrial applicability of the method defined in claims 1-6 or the corresponding device defined in claims 7-8.